

## PATENT COOPERATION TREATY

PCT

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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY  
(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44bis)

Applicant's or agent's file reference 089498-0454	FOR FURTHER ACTION	See item 4 below
International application No. PCT/US2004/024527	International filing date ( <i>day/month/year</i> ) 29 July 2004 (29.07.2004)	Priority date ( <i>day/month/year</i> ) 29 July 2003 (29.07.2003)
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237		
Applicant THE UNIVERSITY OF AKRON		

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 *bis*.1(a).
2. This REPORT consists of a total of 5 sheets, including this cover sheet.  
  
In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.
3. This report contains indications relating to the following items:

<input checked="" type="checkbox"/> Box No. I	Basis of the report
<input type="checkbox"/> Box No. II	Priority
<input type="checkbox"/> Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
<input type="checkbox"/> Box No. IV	Lack of unity of invention
<input checked="" type="checkbox"/> Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
<input type="checkbox"/> Box No. VI	Certain documents cited
<input type="checkbox"/> Box No. VII	Certain defects in the international application
<input checked="" type="checkbox"/> Box No. VIII	Certain observations on the international application
4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44bis.3(c) and 93bis.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44bis .2).

	Date of issuance of this report 30 January 2006 (30.01.2006)
The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer  Yolaine Cussac
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# PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY

To:  
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## PCT

REC'D 18 NOV 2004

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### WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

Applicant's or agent's file reference 089498-0454		Date of mailing (day/month/year) <b>16 NOV 2004</b>
International application No. PCT/US04/24527		FOR FURTHER ACTION See paragraph 2 below
International filing date (day/month/year) 29 July 2004 (29.07.2004)	Priority date (day/month/year) 29 July 2003 (29.07.2003)	
International Patent Classification (IPC) or both national classification and IPC IPC(7): C08K 3/04, H01B 1/18, 1/24 and US Cl.: 252/506, 507, 508; 428/359		
Applicant THE UNIVERSITY OF AKRON		

**1. This opinion contains indications relating to the following items:**

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

**2. FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

**3. For further details, see notes to Form PCT/ISA/220.**

Name and mailing address of the ISA/ US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (703) 305-3230	Authorized officer Dr. Yogendra Gupta Telephone No. 572-272-1700
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WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US04/24527

Box No. I Basis of this opinion

1. With regard to the language, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ This opinion has been established on the basis of a translation from the original language into the following language \_\_\_\_\_, which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).

2. With regard to any nucleotide and/or amino acid sequence disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:

a. type of material

☐ a sequence listing

☐ table(s) related to the sequence listing

b. format of material

☐ in written format

☐ in computer readable form

c. time of filing/furnishing

☐ contained in international application as filed.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority for the purposes of search.

3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

4. Additional comments:

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.  
PCT/US04/24527

Box No. V Reasoned statement under Rule 43 bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims 6-12	YES
	Claims 1-5	NO
Inventive step (IS)	Claims None	YES
	Claims 1-12	NO
Industrial applicability (IA)	Claims 1-12	YES
	Claims NONE	NO

2. Citations and explanations:

Claims 1-5 lack novelty under PCT Article 33(2) as being anticipated by Chacko (US-653). Chacko discloses compositions comprising a polymeric resin such as polyimides and epoxy, and dispersed nanomaterials having conductive fillers and potentially anti-friction additives, and the nanomaterials are preferably selected from carbon nanotubes, vapor grown nanofibers, milled carbon fibers, nanoclays, and molecular silica. The additives included antifriction additives such as graphite and fluoropolymers, a fluorinated surfactant/wetting agent and an organic solvent.

Claims 5-12 lack an inventive step under PCT Article 33(3) as being obvious over Chacko (US-653). The disclosure by Chacko is set forth as above. Chacko teaches the use of nanoparticles including clay and varying the properties of the composite by varying the composition. The dispersion of electrically conductive agent/s by the surfactant thereby improving conductivity and the lowering of percolation threshold limits by nanoparticles would have been obvious, and the manipulation of property of the product by varying the composition per the templates of product-property verses composition per the claim-12 would have been obvious variations of the method of making the composite.

Claims 1-12 lack an inventive step under PCT Article 33(3) as being obvious over Kawata et al (US 5,512,399) in view of Foulger (US-303). Kawata et al disclose a polymer composition comprising a dispersion of conductive carbon black nanoparticles in a polymer matrix of PPS using a dispersant of clay or calcium carbonate, and the nanoparticle nature of the natural clay would have been obvious. Although, the percolation of conductive carbon by the dispersant lowering its threshold to obtain desired conductivity would have been obvious, they are not disclosed by Kawata et al. Foulger et al disclose a conductive polymer composite comprising of a thermoplastic/thermosetting polymers and controlling the distribution of particles in the matrix to effect the maximum benefit by the percolation theory. The polymers included both thermoset and thermoplastics. It would have been obvious to a person of ordinary skill in the art to make obvious modifications to the invention of Kawata et al with the materials and the optimization of the distribution of conductive agent in the polymer matrix using the percolation theory to obviously arrive at the limitations of the instant claims by the applicants, because both the teachings are in the analogous art.

Claims 1-12 meet the criteria set out in PCT Article 33(4), and thus have industrial applicability because the subject matter claimed can be made or used in industry.

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US04/24527

**Box No. VIII Certain observations on the international application**

The following observations on the clarity of the claims, description, and drawings or on the questions whether the claims are fully supported by the description, are made:

Claims 2-4 are objected to under PCT Rule 66.2(a)(v) as lacking clarity under PCT Article 6 because claims are indefinite for the following reason(s): The claims recite the limitation of "the polymeric network" and there is insufficient antecedent basis for this limitation.